Physicochemical properties of hydroxyapatite/montmorillonite nanocomposite prepared by powder sintering

ABSTRACT

This study investigated the effect of the addition of montmorillonite into a hydroxyapatite nanocomposite for biomedical application. Hydroxyapatite (HA)/montmorillonite (MMT) nanocomposite was prepared using a powder sintering technique at 800 °C for 2 h. The specific surface area and pore volume were found to decrease linearly with the addition of MMT. The addition of 10–20% MMT led to a more homogeneous pore size distribution, which resulted in an increase in flexural strength by 18.9–17.1% and an increase in compressive strength by 107.9–63.1%. However, further addition of 30–60% MMT led to a less homogeneous pore size distribution, resulting in a decrease in flexural and compressive strength. The homogeneity of the pore size distribution was found to offer significant control over the strength of the nanocomposites. The addition of MMT resulted in the presence of an anhydrite phase, and this phase is useful to enhance the bioactivity of the nanocomposite. This study shows that the addition of MMT to HA for the formation of HA/MMT nanocomposite has a beneficial effect and has the potential to be used as a biomaterial, especially for non-load bearing sites in bone substitutions.

Keyword: Mechanical properties; Porosity; Hydroxyapatite; Montmorillonite